

CLAIMS

1. A manufacturing apparatus of printed wiring board comprising:
 - 5 a feed roller for conveying a printed wiring board at a specified speed;
 - plural nozzle pipes mounting a plurality of spray nozzles and disposed nearly at uniform intervals parallel to or at a certain angle to the running direction of the printed wiring board;
 - a mechanism for oscillating the nozzle pipes; and
 - 10 a pump for supplying a treating solution to the nozzle pipes, wherein the plural nozzle pipes are composed of nozzle pipes having different apertures.
- 15 2. The manufacturing apparatus of printed wiring board of claim 1, wherein the aperture of the nozzle pipe positioned in the center out of the plural nozzle pipes is larger than the aperture of the nozzle pipes at both sides.
- 20 3. A manufacturing apparatus of printed wiring board comprising:
 - a feed roller for conveying a printed wiring board at a specified speed;
 - plural nozzle pipes mounting a plurality of spray nozzles and
 - 25 disposed nearly at uniform intervals parallel to or at a certain angle to the running direction of the printed wiring board;
 - a mechanism for oscillating the nozzle pipes;
 - a pump for supplying a treating solution to the nozzle pipes; and
 - plural piping pipes disposed between plural nozzle pipes and the pump;
 - 30 wherein the piping pipes are composed of piping pipes having different apertures.
- 35 4. The manufacturing apparatus of printed wiring board of claim 3, wherein the plural nozzle pipes are identical in the aperture, and the aperture of the piping pipe positioned in the central nozzle pipe out of the plural piping pipes is larger than the aperture of the piping pipes at both sides.
- 40 5. A manufacturing apparatus of printed wiring board comprising:
 - a feed roller for conveying a printed wiring board at a specified speed;
 - plural nozzle pipes mounting a plurality of spray nozzles and
 - 45 disposed at specified intervals parallel to or at a certain angle to the running direction of the printed wiring board;

a mechanism for oscillating the nozzle pipes;
a pump for supplying a treating solution to the nozzle pipes; and
a pressure regulating valve and a pressure gauge connected in an
individual passage between the pump and the each nozzle pipe.

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6. The manufacturing apparatus of printed wiring board of claim 5, wherein the plural nozzle pipes are disposed at narrower intervals at central positions among other plural nozzle pipes.

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7. The manufacturing apparatus of printed wiring board of claim 5, wherein a flow rate regulating valve and a flow meter are used instead of the pressure regulating valve and the pressure gauge.

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8. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 6, being characterized by setting the plural nozzle pipes so that the indication of the pressure gauge of the nozzle pipe in the center may be higher than the indication of the pressure gauges of the nozzle pipes at both sides by controlling the opening degree of the individual pressure regulating valves, oscillating the nozzle pipes at a constant angle, and treating by conveying at a specified speed while blowing a treating solution to the printed wiring board.

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9. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 7, being characterized by setting the plural nozzle pipes so that the indication of the flow meter of the nozzle pipe in the center may be higher than the indication of the flow meter of the nozzle pipes at both sides by controlling the opening degree of the individual flow rate regulating valves, oscillating the nozzle pipes at a constant angle, and treating by conveying at a specified speed while blowing a treating solution to the printed wiring board.

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10. A manufacturing apparatus of printed wiring board comprising:

a feed roller for conveying a printed wiring board at a specified speed;

plural nozzle pipes mounting a plurality of spray nozzles and disposed parallel to or at a certain angle to the running direction of the printed wiring board;

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a mechanism for oscillating the nozzle pipes; and

a pump for supplying a treating solution to the nozzle pipes;

wherein the mechanism for oscillating the nozzle pipes is disposed independently in each nozzle pipe.

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a link mechanism and

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a first treating booth having plural nozzle pipes mounting a plurality of spray nozzles and disposed at a certain angle to the running direction of the printed wiring board; and

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speed of the central nozzle pipe larger than the pressure, oscillating angle and oscillating speed of the nozzle pipes at both sides, and treating by conveying at a specified speed while blowing a treating solution to the printed wiring board.

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19. A manufacturing method of printed wiring board using the manufacturing apparatus of claim 16, being characterized by setting the plural nozzle pipes of the first treating booth so that the oscillating angle of the central nozzle pipe may be smaller than the oscillating angle of the nozzle pipes at both sides and that the oscillating speed may be larger, and setting the plural nozzle pipes of the second treating booth so that the oscillating angle of the central nozzle pipe may be smaller than the oscillating angle of the nozzle pipes at both sides and that the oscillating speed may be larger, and also setting larger than the oscillating angle and smaller than the oscillating speed of the corresponding nozzle pipes of the first treating booth.

20. A manufacturing apparatus of printed wiring board comprising:

a feed roller for conveying a printed wiring board at a specified speed;

plural nozzle pipes mounting a plurality of spray nozzles and disposed parallel to or at a certain angle to the running direction of the printed wiring board;

a mechanism for oscillating the nozzle pipes;

a pump for supplying a treating solution to the nozzle pipes; and

a pressure-proof flexible tube disposed between each one of the plural nozzle pipes and the pump.

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21. The manufacturing apparatus of printed wiring board of claim 20, wherein the interval between adjacent nozzle pipes of the plural nozzle pipes is variable.

22. The manufacturing apparatus of printed wiring board of claim 20, wherein the individual nozzle pipes of the plural nozzle pipes are movable vertically to the running direction of the printed wiring board.

23. The manufacturing apparatus of printed wiring board of claim 20, further comprising:

a first support member penetrated by each nozzle pipe of the plural nozzle pipes and supported in an oscillatable state;

a second support member supporting the first support member in a state movable in a specific direction; and

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a mechanism supporting the second support member in a state movable in a vertical direction to the moving direction of the first support member.

5 24. The manufacturing apparatus of printed wiring board of claim 23, further comprising:

 a first flexible bellows member disposed on the second support member at both sides of the first support member so as to cover the moving region; and

10 a second flexible bellows member disposed at both sides of the second support member so as to cover the moving region.

15 25. The manufacturing apparatus of printed wiring board of claim 20, further comprising a pressure regulating valve disposed in each passage of the each nozzle pipe, the pressure-proof flexible tube and the pump, and a pressure gauge disposed at the downstream side thereof.

20 26. The manufacturing apparatus of printed wiring board of claim 20, wherein the mechanism for oscillating the nozzle pipe is an independent mechanism in each nozzle pipe.

25 27. The manufacturing apparatus of printed wiring board of claim 26, wherein the oscillating angle and oscillating speed are individually variable in the independent mechanism for oscillating the each nozzle pipe.

30 28. The manufacturing apparatus of printed wiring board of claim 26, wherein a cam, a link mechanism, and a control motor are provided in the each nozzle pipe as the independent mechanism for oscillating each nozzle pipe.

35 29. The manufacturing apparatus of printed wiring board of claim 28, wherein the independent oscillating mechanism comprising the cam, link mechanism and control motor, and each nozzle pipe are coupled with a flexible wire.

40 30. The manufacturing apparatus of printed wiring board of claim 28, wherein the oscillating angle of the each nozzle pipe is variable by adjusting the cam and link mechanism.

45 31. The manufacturing apparatus of printed wiring board of claim 28, wherein the rotating speed of the control motor is controlled by an inverter circuit or a current or voltage control circuit, and the oscillating speed of the each nozzle pipe is varied.

32. The manufacturing apparatus of printed wiring board of claim 23, further comprising means for moving the first support member and the second support member.

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33. The manufacturing apparatus of printed wiring board of claim 32, wherein the moving means is a linear motion.

34. The manufacturing apparatus of printed wiring board of claim 32, further comprising means for controlling the moving position by the control circuit.

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35. The manufacturing apparatus of printed wiring board of claim 34, further comprising means for storing dimension data of printed wiring board and means for feeding the dimension data into the control circuit.

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36. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 21, being characterized by setting the plural nozzle pipes at narrower interval in the central nozzle pipes, oscillating the nozzle pipes, and treating by conveying at a specified speed while blowing a treating solution to the printed wiring board.

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37. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 22, being characterized by setting the plural nozzle pipes with the central nozzle pipes at a position close to the board conveying surface side, oscillating the nozzle pipes, and treating by conveying at a specified speed while blowing a treating solution to the printed wiring board.

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38. The manufacturing method of printed wiring board of claim 36 or 37 using the manufacturing apparatus of printed wiring board of claim 26, wherein the oscillating speed and oscillating angle of the central nozzle pipes of the plural nozzle pipes are set larger than the oscillating speed and oscillating angle of the nozzle pipes at both sides.

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39. The manufacturing method of printed wiring board of claim 36 using the manufacturing apparatus of printed wiring board of claim 25, wherein the opening degree of the individual pressure regulating valves is set so that the indication of the pressure gauge of the central nozzle pipe out of the plural nozzle pipes may be higher than the indication of the pressure gauges of the nozzle pipes at both sides.

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40. The manufacturing method of printed wiring board of claim 37 using the manufacturing apparatus of printed wiring board of claim 25, wherein the opening degree of the individual pressure regulating valves is set so that the indication of the pressure gauge of the central nozzle pipe out of the plural nozzle pipes may be higher than the indication of the pressure gauges of the nozzle pipes at both sides.

41. The manufacturing method of printed wiring board of claim 38 using the manufacturing apparatus of printed wiring board of claim 25, wherein the opening degree of the individual pressure regulating valves is set so that the indication of the pressure gauge of the central nozzle pipe out of the plural nozzle pipes may be higher than the indication of the pressure gauges of the nozzle pipes at both sides.

42. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 35, being characterized by measuring the dimension of the printed wiring board preliminarily in the lateral direction to the running direction, feeding the dimension data in storing means, moving and setting the interval of the nozzle pipes corresponding to the dimension data, and treating by conveying at a specified speed while blowing a treating solution to the printed wiring board.

43. A manufacturing apparatus of printed wiring board comprising:
a feed roller for conveying a printed wiring board at a specified speed;
plural nozzle pipes mounting a plurality of spray nozzles and disposed parallel to or at a certain angle to the running direction of the printed wiring board;
a mechanism for oscillating the nozzle pipes;
plural pumps corresponding to each nozzle pipe for supplying a treating solution to the nozzle pipes; and
a pressure gauge connected in an individual passage between each nozzle pipe and the pump;
wherein the output of each pump is controlled by an inverter circuit or a current or voltage control circuit.

44. A manufacturing apparatus of printed wiring board comprising:
a feed roller for conveying a printed wiring board at a specified speed;

a first treating booth having plural nozzle pipes mounting a plurality of spray nozzles and disposed at a certain angle to the running direction of the printed wiring board; and

5 a second treating booth having plural nozzle pipes disposed at a reverse angle to the above nozzle pipes;

a mechanism for oscillating the nozzle pipes in the first treating booth and the second treating booth;

plural pumps corresponding to each nozzle pipe for supplying a treating solution to the nozzle pipes; and

10 a pressure gauge connected in an individual passage between each nozzle pipe and the pump;

wherein the output of each pump is controlled by an inverter circuit or a current or voltage control circuit.

15 45. The manufacturing apparatus of printed wiring board of claim 43 or 44, wherein the mechanism for oscillating the nozzle pipe is an independent mechanism in each nozzle pipe.

20 46. The manufacturing apparatus of printed wiring board of claim 45, wherein the oscillating angle and oscillating speed are individually variable in the independent mechanism for oscillating the each nozzle pipe.

25 47. The manufacturing apparatus of printed wiring board of claim 46, wherein a cam, a link mechanism, and a control motor are provided in the each nozzle pipe as the independent mechanism for oscillating each nozzle pipe.

30 48. The manufacturing apparatus of printed wiring board of claim 47, wherein the oscillating angle of each nozzle pipe is variable by adjusting the cam and link mechanism.

35 49. The manufacturing apparatus of printed wiring board of claim 47, wherein the rotating speed of the control motor is controlled by an inverter circuit or a current or voltage control circuit, and the oscillating speed of the each nozzle pipe is varied.

40 50. The manufacturing apparatus of printed wiring board of claim 46, wherein a stepping motor is used as the independent mechanism for oscillating the each nozzle pipe.

45 51. The manufacturing apparatus of printed wiring board of claim 50, wherein the rotating angle or rotating speed of the stepping motor are controlled by a control and drive circuit.

52. The manufacturing apparatus of printed wiring board of claim 43, being a manufacturing apparatus of printed wiring board having N nozzle pipes comprising:

- 5 means for dividing at least into N regions in the running direction of the printed wiring board before treating a printed wiring board and storing data of processing area of each divided block;
- means for storing correction data of each nozzle pipe;
- means for selecting correction data corresponding to each divided block as output data;
- 10 means for calculating the final output data to each spray pump from the selected output data; and
- means for controlling the spray pump output corresponding to the final output data.

- 15 53. The manufacturing apparatus of printed wiring board of claim 52, further comprising means for controlling the rotating speed of the control motor for oscillating the each nozzle pipe corresponding to the final output data.

- 20 54. The manufacturing apparatus of printed wiring board of claim 52, further comprising means for controlling the rotating angle or rotating speed of the stepping motor for oscillating the each nozzle pipe corresponding to the final output data.

- 25 55. The manufacturing apparatus of printed wiring board of claim 52, further comprising an output route from the means for controlling the spray pump output to the inverter circuit or current or voltage control circuit of each spray pump.

- 30 56. The manufacturing apparatus of printed wiring board of claim 53, further comprising an output route from the means for controlling the rotating speed of the control motor to the inverter circuit or current or voltage control circuit of each control motor.

- 35 57. The manufacturing apparatus of printed wiring board of claim 54, further comprising an output route from the means for controlling the rotating angle or rotating speed of the stepping motor to the control and drive circuit of each stepping motor.

- 40 58. The manufacturing apparatus of printed wiring board of claim 52, wherein the treating condition of spray pressure, oscillating speed or oscillating angle set in each nozzle pipe is entered in the correction data as electric signal.

- 45 59. The manufacturing apparatus of printed wiring board of

claim 58, wherein a plurality of correction data are stored preliminarily in the means for storing the correction data depending on the treating area.

5 60. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 43, being characterized by setting the plural nozzle pipes so that the indication of the pressure gauge of the central nozzle pipe may be higher than the indication of the pressure gauges of the nozzle pipes at both sides
10 by controlling each pump output, oscillating the nozzle pipes, and treating by conveying at a specified speed while blowing a treating solution to the printed wiring board.

15 61. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 44, being characterized by setting the plural nozzle pipes of the first treating booth so that the indication of the pressure gauge of the central nozzle pipe may be higher than the indication of the pressure gauges of the nozzle pipes at both sides, setting the plural nozzle pipes of the
20 second treating booth so that the indication of the pressure gauge of the central nozzle pipe may be higher than the indication of the pressure gauges of the nozzle pipes at both sides and lower than the indication of the pressure gauge of the central nozzle pipe of the first treating booth by controlling each pump output, oscillating the nozzle
25 pipes, and treating by conveying at a specified speed while blowing a treating solution to the printed wiring board.

30 62. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 46, being characterized by setting the oscillating angle of the central nozzle pipe out of the plural nozzle pipes smaller than the oscillating angle of the nozzle pipes at both sides and the oscillating speed larger.

35 63. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 46, being characterized by setting the oscillating angle of the central nozzle pipe out of the plural nozzle pipes of the first treating booth smaller than the oscillating angle of the nozzle pipes at both sides and the oscillating speed larger, and setting the oscillating angle of the central
40 nozzle pipe out of the plural nozzle pipes of the second treating booth smaller than the oscillating angle of the nozzle pipes at both sides and larger than the oscillating angle of the nozzle pipes of the first treating booth and the oscillating speed smaller.

45 64. A manufacturing method of printed wiring board using the

manufacturing apparatus of printed wiring board of claim 52, being characterized by calculating the treating area data of each division block from the CAD data for drawing a wiring pattern of printed wiring board, feeding the treating area data into storing means, oscillating the nozzle pipes at specified oscillating angle and oscillating speed at the pressure setting of each nozzle pipe corresponding to each pump output, and conveying the printed wiring board at a specified speed while blowing a treating solution to the printed wiring board.

65. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 53, being characterized by calculating the treating area data of each division block from the CAD data for drawing a wiring pattern of printed wiring board, feeding the treating area data into storing means, oscillating the nozzle pipes at pressure setting and oscillating speed of each nozzle pipe corresponding to each pump output, and conveying the printed wiring board at a specified speed while blowing a treating solution to the printed wiring board.

66. A manufacturing method of printed wiring board using the manufacturing apparatus of printed wiring board of claim 54, being characterized by calculating the treating area data of each division block from the CAD data for drawing a wiring pattern of printed wiring board, feeding the treating area data into storing means, oscillating the nozzle pipes at pressure setting of each nozzle pipe corresponding to each pump output and the rotating angle or rotating speed of the stepping motor, and conveying the printed wiring board at a specified speed while blowing a treating solution to the printed wiring board.

67. The manufacturing apparatus of printed wiring board of any one of claims 1, 3, 5, 10, 20, 43, and 44, wherein the treating solution is an etchant.

68. The manufacturing method of printed wiring board of any one of claims 8, 9, 17 to 19, 36, 37, 42, 59, 61, and 64 to 66, wherein the treating solution is an etchant.